

Tsu-Yun Chen¹, Chia-Hui Wu¹, Sylwia Klewin-Steinböck²

Management of orthodontically induced fenestration-type defect with root exposure of upper molar – case report

Postępowanie z ortodontycznie indukowaną fenestracją oraz obnażeniem korzenia górnego trzonowca – opis przypadku

¹ DDS student, Poznan University of Medical Sciences, Poland*Student, Uniwersytet Medyczny im. Karola Marcinkowskiego w Poznaniu*² Chair and Department of Dental Surgery, Periodontal and Oral Mucosa Diseases,

Poznan University of Medical Sciences, Poland

*Katedra i Klinika Chirurgii Stomatologicznej, Chorób Przyzębia i Błony Śluzowej Jamy Ustnej,**Uniwersytet Medyczny im. Karola Marcinkowskiego w Poznaniu*DOI: <http://dx.doi.org/10.20883/df.2022.5>

ABSTRACT

Mucosal fenestration is a relatively uncommon complication in orthodontic treatment. It can be easily neglected and thus the management of the condition has not been reported often. Treatment of mucosal fenestration depends on the extent of soft and hard tissue destruction. This article presents the case report of a 42-year-old male patient with fenestration-type defect around maxillary first molar. The patient has a history of complex orthodontic treatment. In this case, the fenestration was treated with buccal root apicoectomy. The healing process went well. Follow-up visits were scheduled after one month and six months after the procedure.

Keywords: mucosal fenestration, bone fenestration, orthodontic treatment.

STRESZCZENIE

Fenestracja błony śluzowej jest stosunkowo rzadkim powikłaniem leczenia ortodontycznego. Można je łatwo zlekceważyć, dlatego leczenie nie było często opisywane. Leczenie fenestracji błony śluzowej zależy od stopnia zniszczenia tkanek miękkich i twardych. W artykule przedstawiono opis przypadku 42-letniego pacjenta z fenestracyjnym ubytkiem w okolicy pierwszego trzonowca szczęki. W wywiadzie pacjent miał za sobą złożone leczenie ortodontyczne. W opisywanym przypadku przeprowadzono apikoektomię korzeni policzkowych. Proces gojenia przebiegł pomyślnie. Wizyty kontrolne wyznaczono po miesiącu i po 6 miesiącach od zabiegu.

Słowa kluczowe: fenestracja błony śluzowej, fenestracja kości, leczenie ortodontyczne.

Introduction

Malocclusion is considered by the World Health Organization as one of the most important oral health problems. Depending on the population, the incidence varies between 39% and 93% what makes orthodontic treatment one of the most common procedures [1]. At the same time orthodontic treatment can be associated with a number of adverse effects, resulting from inadequate diagnosis or treatment, which may lead to reversible or irreversible damage.

Orthodontic tooth movement is achieved by alveolar bone remodeling in response to mechanical stress. Mechanical forces trigger a bone resorption at the point of compression. During orthodontic treatment, sometimes the tips of the teeth tilt towards the lip, cheek or tongue, and even break

through the cortical plate of the maxilla or mandible. This tooth movement may be accidental or a deliberately planned procedure, either as an intended final tooth positioning or as a stage of treatment whereby the root apex is brought back into the cancellous bone [2]. In addition, the force like compression on periodontal ligaments is a causative factor of inflammation and root resorption [3]. Therefore, it is essential to assess the risks of orthodontic treatment since it can sometimes induce periodontal disease, tooth mobility, pulpal reaction, trauma, enamel demineralization, caries, enamel wear, temporomandibular dysfunction or psychological problems [4].

As mentioned earlier, orthodontic movement of the tooth can lead to a change in the long axis of the tooth, resulting in the formation of fenestra-

tions - isolated areas where the exposed root surface is covered only by the periosteum and gingiva, but the remaining cortical bone remains intact. In more advanced clinical situations, when treatment was not initiated early enough or in patients with a thin biotype, mucosal rupture may occur. Mucosal fenestration is a clinical condition where the periodontal breakdown occurs leading to a loss of the overlying alveolar bone and mucosa, resulting in exposure of the root. The most commonly involved teeth are incisors. The literature on apical fenestrations associated with posterior teeth is limited. The etiology of mucosal fenestration defect includes decreased thickness of the alveolar bone, labial placement of the tooth in the dental arch, contour of the root apex, abnormal occlusal factors, orthodontic tooth movement, periodontal and endodontic pathology, and abnormal frenal attachment [5].

This case report describes a rare situation: orthodontically induced root mucosal fenestration along with external root resorption, which was developed in the maxillary right molar apical to the muco-gingival junction.

Case description

During the 6-month follow-up, a 42-year-old healthy man reported a recurrent feeling of food reten-

tion in the vestibule of the mouth on the right side. In addition, the patient reported the occurrence of aphthous ulcerations on the buccal mucosa in the last 2 years (not reported in the previous observation). The frequency of ulcers has increased in the last 6 months.

The patient has a malocclusion, an open bite (tooth contact begins on the second premolar) and a bilateral posterior crossbite.

Based on patient's medical history, the primary diagnosis for malocclusion was prognathism and occlusal apertognathia. At the age of 18, the patient underwent surgical correction for prognathism: vertical – oblique osteotomy on mandibula followed by extraction of four first premolars and two and a half years of orthodontic treatment. The result of the treatment was not fully satisfactory, despite the correction of the prognathism, the open bite was not corrected.

On intraoral examination, the apex of the distal buccal root of tooth 16 was visible in the vestibule of the oral cavity (**Figure 1**). The apex of the mesial root was palpable but not visible. Tooth treated endodontically 4 years ago, canals filled with the lateral condensation technique with gutta-percha points and AH plus sealer. Tooth was not sensitive to both horizontal and vertical percussion. No mobility was observed. Gingival recession was visible on



Figure 1. Clinical image. Apex of distal buccal root visible in oral cavity

Rycina 1. Obraz kliniczny. Widoczny w przedsionku wierzchołek korzenia policzkowego dalszego

tooth 16, but there was no periodontal pocket and no communication on periodontal probing between gingival sulcus and fenestration.

After intra-oral examination additional tests were ordered – panoramic X-ray and cone-beam computed tomography (CBCT). The panoramic image showed numerous external resorption of root apices (teeth 15, 12, 11, 21, 22, 25). Teeth are vital (show a normal response to ethyl chloride), not mobile. No treatment for those teeth was initiated, it was decided to leave them for observation and annual x-ray checking. On CBCT, a significant disproportion in the structure of the maxilla on the right

and left sides was observed. The bone on the right side is more narrow, the maxillary sinus is smaller and located much higher. Parts of the roots are placed outside the alveolar bone (**Figures 2 and 3**).

Treatment

On the first visit, the exposed root was scaled and planed, full-mouth scaling was also done. The integrity of the old root canal filling was checked. The gingival biotype was defined as thin. During orthodontic consultation it was decided that orthodontic treatment would not be beneficial and could worsen the condition.

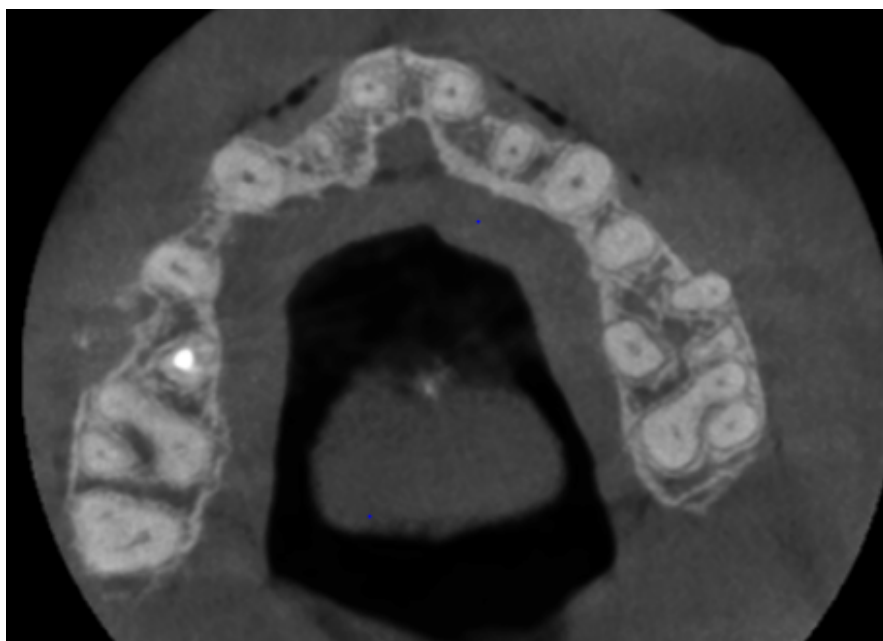


Figure 2. CBCT – axial section
Rycina 2. CBCT – przekrój osiowy

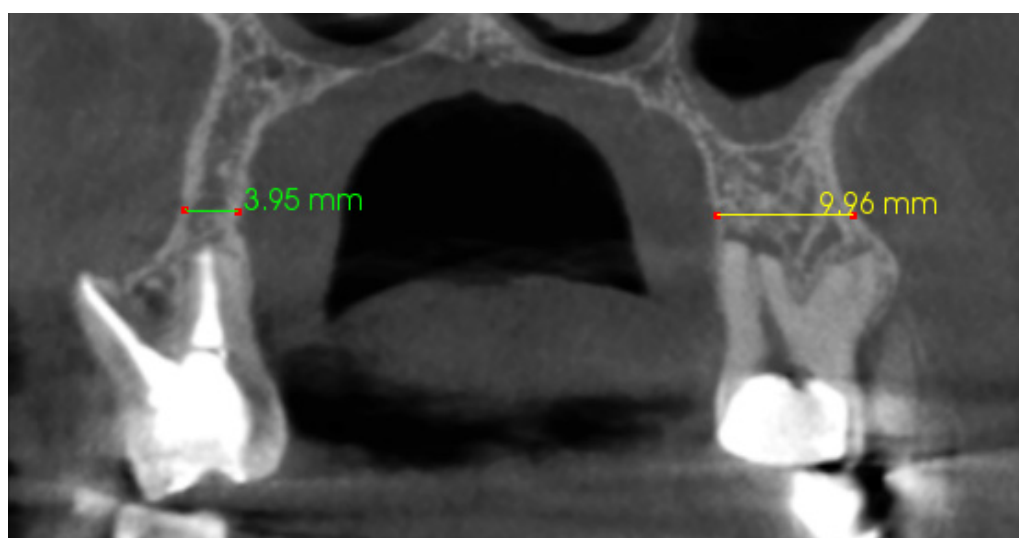


Figure 3. CBCT – frontal section. Obvious disproportion between the left and right maxilla
Rycina 3. CBCT - przekrój czołowy. Wyraźna dysproporcja w szerokości prawej i lewej kości szczękowej

After considering of all the factors, the decision to perform apicoectomy was made. A trapezoidal flap was performed under Citocartin 200 local anesthesia. Release cuts were made at the height of distal part of teeth 17 and mesial part of teeth 15. After the full-thickness mucoperiosteal flap was dissected, the alveolar bone and the fenestration site were exposed. Only partial loss of the alveolar cortical plate was found on the buccal side in the region of the mesial and distal roots, without sign of inflammation of the bone. Using a surgical contra-angle handpiece and a fissure drill cooled with sterile saline, the visible part of the roots was cut down below bone level. The flap was placed in a new position to cover gingival recession and fixed with Dafilon 6/0 sutures. The damage to the mucous membrane by the penetrating tooth tip was left to heal on its own. The healing process went well and sutures were removed after 10 days. Follow-up visits were scheduled after one month and six months after the procedure.

Discussion

It was difficult to compare our case to others, because we did not find a case related to tooth movement in the literature. The reported cases we found were associated with chronic periapical inflammation, and apicoectomy usually was needed in the presence of infection, not apex displacement through cortical bone.

Mucosal fenestrations were first described by Menéndez OR in 1967. These defects may create problems in plaque control, caries, root hypersensitivity and aesthetics. There are currently no guidelines on the diagnosis and management of apical fenestrations due to being infrequently reported in the literature [6]. Established literature does not show any long-term clinical study with a large sample size of mucosal fenestration as the finding is rare.

The exact etiology of mucosal fenestration is unknown, but a review of the literature suggests simultaneous extreme buccal location of the root tips and a very thin or absent alveolar, cortical plate as possible etiological factors. Additional predisposing factors are thin gingival biotype, chronic periodontitis, orthodontic tooth movement, periodontal pathology and endodontic pathology [8, 9]. In case of endodontically treated teeth, the already existing defect caused by bone resorption because of the disease process may develop into alveolar fenestration and further into fenestration of mucosa by exposure of the mucosa covering the roots [10].

Several treatment modalities have been proposed in the literature. These include root planning along with chlorhexidine mouth rinsing, full thickness mucogingival flap with primary closure, pedicle flap surgery, free gingival grafting, and guided tissue regeneration [11,12].

The treatment should be decided based on the degree of osseous defect and protrusion at the root apex. Numerous studies indicate a higher percentage of success by using connective tissue graft (CTG) for root coverage [13-16]. The most predictable result is achieved by use of pedicle grafts along with submerged CTG beneath the flap, which provides an environment of maximum blood supply to the graft [17-19]. Other possible alternative for management of fenestrations could be the use of bioabsorbable membranes. In alveolar fenestrations or dehiscences, a membrane would be preferred because it will aid in guided tissue regeneration (GTR) [20]. In some conditions, coverage of Gingival Fenestration by using Modified Pouch and Tunnel Technique is also an option. The advantage of using Modified Pouch and Tunnel Technique is minimizing the necessity to facilitate access without involving the gingival margin and the papilla thereby improving the blood supply to the graft and further reducing patient morbidity [21]. As mentioned above, one of the prerequisites for complete recuperation of the periodontal tissues is the maintenance of adequate vascularization in the flaps and grafts. The techniques proposed in the literature were related to the treatment of fenestrations associated with tissue inflammation, and therefore have no direct relevance to the described clinical situation.

In the case of fenestration caused by tooth displacement it is worth considering orthodontic treatment, in particular an attempt to change the long axis of the tooth and, as a result, bone regeneration. In described case orthodontic treatment was rejected after consultation with orthodontist. Due to the patient maxilla structure, it was concluded that this procedure would lead to palatal fenestration, and the palatal apicoectomy would be associated with a much higher risk of complications and failure.

Conclusion

In case discussed, the abnormal inclination of the mesiobuccal root apex was the result of the coexistence of two factors - orthodontic treatment and abnormalities in the anatomical structure of the maxilla. Consequently, the development of buccal fenestration was facilitated by a third fac-

tor, a thin gingival biotype. When choosing a method of treatment, not only the possibilities of the latest periodontal surgery procedures (GTR), but also anatomical and histological aspects should be considered. In this case, the most important aspect determining the method of treatment was the lack of signs of osteitis, which should allow bone regeneration. We considered the selected method of treatment to be the best for the patient.

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Declaration of patient consent

The authors certify that they have obtained all relevant patient consent forms. In the form, the patient agreed to include his photos and other clinical information in the article.

Conflict of interest statement

The authors declare no conflict of interest.

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Correspondence address:
sklewinsteinbock@ump.edu.pl